



Association of Non-Modifiable Risk Factors with Coronary Artery Disease (CAD) in a Tertiary Care Hospital in Peshawar, Pakistan

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ABSTRACT

Introduction: Coronary Artery Diseases (CAD) have been estimated to be the leading cause of mortalities in developing countries in the year 2010. It is evident from previous studies that healthy life style choices can help in the reduction of CAD risk factors. They are either modifiable risk factors including hypertension, hypercholesterolemia, smoking, diabetes mellitus, obesity, and psychological stress or non-modifiable risk factors such as age, gender, family history and ethnicity. Non modifiable risk factors, however, are not studied in detail regarding their association with CAD.

Objective: The objective of this study was to assess non-modifiable risk factors associated with CAD in patients and to devise strategies to deal with these risk factors to reduce the incidence of CAD among local population.

Methodology: Retrospective observational study was conducted at Peshawar Institute of Cardiology (PIC). Data was extracted from Electronic Medical Records (EMR) of 98 patients including non-modifiable risk factors associated with CAD i.e., gender, age and family history.

Results: The analysis performed indicated that in patients with CAD, non-modifiable risk factors such as age and gender play a significant role ($p < 0.05$) however, family history did not show any significance.

Conclusion: In conclusion, this study indicated that in the CAD patients, risk increases with ageing and the incidence of the disease was more frequent in male patients. The study also suggested that family history did not show significant results as a risk factor for CAD in patients. For future prospective, the study can be conducted on larger populations and in other cities of Pakistan.

Key Words: Coronary Artery Disease, Non-modifiable risk factors, Family history, Age, Gender, Association, Patients

INTRODUCTION

Cardiovascular Diseases (CVD) are one of the leading causes of death worldwide and pose a serious threat to public health globally. CVDs were responsible for causing 16.7 million deaths in 2000 while 17 million deaths in 2008 out of which 80% of the deaths were caused in middle and lower middle-income countries.^{1,2} Coronary artery diseases (CAD) have been estimated to be the leading cause of mortalities in developing countries in the year 2010.³ It is evident from previous studies that healthy life style choices can help in the reduction of CAD risk factors, they are either modifiable risk factors including hypertension, hypercholesterolemia, smoking, diabetes mellitus, lack of physical activity, obesity, and

psychological stress or non-modifiable risk factors include age, gender, family history and ethnicity.⁴⁻¹⁰ Non-modifiable risk factors, however, are not studied in detail regarding their association with CAD.

It is evident from previous studies that age over 65 and male gender act as pivotal factors in CAD.^{4,11} Females are prone to developing CAD after menopause. Parental history also plays an important role in CAD and it has been observed that it is a constant risk factor despite of age, gender, geographical location and socioeconomic background.¹² Premature CAD occurs in families with family history of CAD. The disease can be prevented if families are identified with positive CAD history at early stages.¹³

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Similarly, people living in underprivileged areas are at a greater risk for developing CAD than other population.¹⁴ Different ethnic groups are inclined to develop CAD at different rates, leading to a higher prevalence or severity of the disease in certain populations.¹⁵ However, among people with higher genetic risk, a healthy lifestyle can reduce the risk of CAD by 50% as compared to individuals following an unhealthy lifestyle.¹⁶

Pakistan is also a lower middle-income country where CVDs are a major health problem and the number of patients is escalating daily. Despite the fact that cardiovascular diseases pose a serious threat to human health in low-and middle-income countries, minimal importance is given to the prevention of CAD risk factors in South Asian region, particularly in Pakistan. The knowledge of these risk factors associated with CAD can assist in policy making for its effective control in the local community. Thus, assessment of risk factors is quite essential in the prevention and management of CAD. Numerous studies have been conducted regarding the CAD risk factors but there is scarcity of literature in Pakistani setting.

The objective of this study was to assess non-modifiable risk factors associated with CAD in patients presented at Peshawar Institute of Cardiology (PIC) and to devise strategies to deal with the non-modifiable risk factors to reduce the incidence of CAD among local population.

METHODOLOGY

Study Design

This retrospective observational study was conducted on the patients presented with Coronary Artery Disease (CAD) at Peshawar Institute of Cardiology (PIC).

Data Collection

Data of 98 patients of Peshawar Institute of Cardiology (PIC) was extracted from electronic medical records (EMR) of PIC.

Inclusion criteria

The inclusion criteria for this study were non-modifiable risk factors associated with CAD including gender, age and family history of CAD.

Exclusion Criteria

Exclusion criteria for this study were patients identified with modifiable risk factors including diabetes, hypertension or obesity.

Ethical Approval

The study was conducted after the ethical approval from Institutional Ethical Committee (HOD/06/123) of PIC.

Data Analysis

Data analysis was performed using Statistical Package of Social Sciences (SPSS) version 26. Mean and Standard Deviation were calculated for scalar variables including age, SPO₂, BP and heart rate. Frequency and Percentages were calculated for nominal variables including gender, city, marital status, family history of CAD, complaints, CAD presentation, arterial access site, PCI status, number of diseased vessels and management. Frequency distribution tables and graphs were used for performing descriptive statistics. To assess the significance, correlation of non modifiable risk factors with CAD, t-test was applied.

RESULTS

The study was conducted (n=98) patients presented with CAD at PCI. For the assessment of age, we distributed age according to the Quartiles, which did show that after the first division of age data 54% of patient fell in the first two quartile (Q1 and Q2) while 44% of the patients fell in the last half of the quartiles. This is an indication that CAD is becoming more prevalence among younger age male population.

Table 1: Age wise distribution of patients

Table 2 Baseline characteristics	Number of patients (n)	Cumulative Percentage (%)
Q-1 37-47	18	54%
Q-2 48-58	36	
Q-3 59-69	29	44%
Q-4 70-80	15	

The frequencies and percentages were calculated for non-modifiable risk factors.

Table 2: Baseline characteristics

Baseline Characteristics	Frequency	Percentage
Gender		
Female	15	15.3
Male	83	84.7
Marital Status		
Married	97	99.0
Single	1	1.0
Family History of Premature CAD		
No	93	94.9
Yes	5	5.1
Complaints		
Chest pain	74	75.5
Chest pain and shortness of breath	21	21.4

Table 2: (Continued)

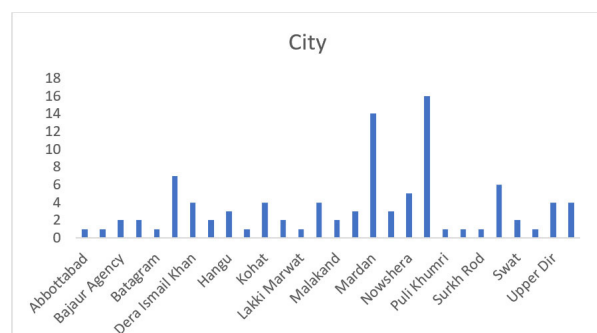
Baseline Characteristics	Frequency	Percentage
Chest pain, Nausea and shortness of breath	2	2.0
Shortness of breath	1	1.0
PCI		
No	2	2.0
Yes	96	98.0
Arterial Access Site		
Femoral	13	13.3
Radial	85	86.7
No of Diseased Vessels		
Double	45	45.9
Normal	1	1.0
Single	29	29.6
Triple	23	23.5

Table 2 shows the frequency and percentages of baseline characteristics associated with this study. Gender wise 84.7% of the patients were male, which depicts that the percentage of male patients was higher than female patients. Considering the marital status, 99% of the CAD patients were married. Similarly, out of 98 patients, only 5% of the presented patients had a premature CAD family history.

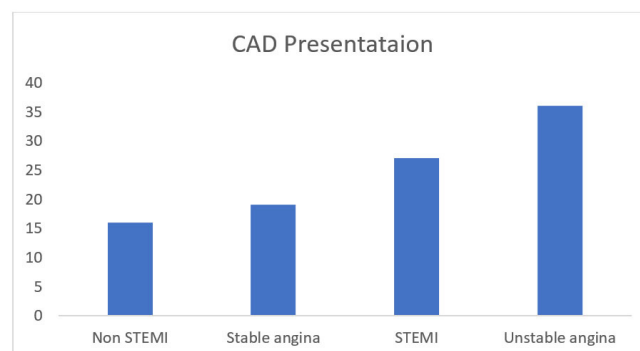
The most frequent complaint of CAD patients was chest pain (75.5%). The PCI status of patients was assessed and it indicated that 98% of the patients went under PCI procedure. Considering the arterial access site, radial approach was mostly used in the patients. The procedure of 86.7% patients was done by radial access site while 13.3% were done using femoral approach.

The number of diseased vessels was also calculated in the selected patients. It was concluded that most of the patients had double vessel disease with a percentage of about 45.9%.

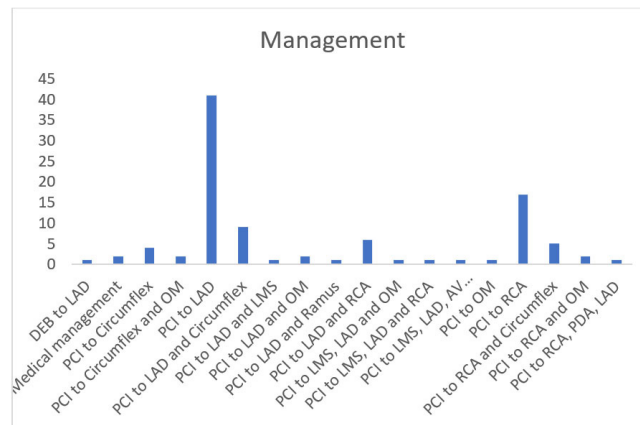
Similarly, frequency and percentages were assessed for different cities. Graph 1 Shows that most of the patients presented at PIC were from Peshawar, Mardan and Charsadda with percentages 16.3%, 14.3% and 7.1% respectively.

**Graph 1:** City wise frequency and percentages.

The most frequent presentation in CAD patients was unstable angina with a percentage of about 36.7%, following ST elevated myocardial infarction (STEMI) with a percentage of 27.6%, whereas stable angina and non-ST elevated myocardial infarction (NSTEMI) with percentages 19.4% and 16.3% respectively.

**Graph 2:** Frequency and percentage of CAD presentation.

For the management of the disease in presented CAD patients, different treatment approaches were used. PCI to LAD was performed for most of the patients having a percentage of about 41.8%. The second widely used approach was PCI to RCA with a percentage of about 17.3% as given in Graph 3

**Graph 3:** Disease management approaches in CAD patients.

Mean and Standard Deviation were calculated for age, SPO₂, and heart rate values of the patients (Table 3). The mean age of the patients was (57.82 ± SD 10.621), mean SPO₂ (97.58 ± SD 1.598) while mean heart rate was (78.64 ± SD 15.766).

Table 3: Mean and Standard Deviation values

Variables	Mean	Standard Deviation (±SD)
Age	57.82	±10.621
SPO ₂	97.58	±1.598
Heart Rate	78.64	±15.766

To analyse the significance of non modifiable risk factors in the development of CAD, t-test was performed (Table 4). The t-test results showed significant results for age and gender as non modifiable risk factors in the development of CAD considering the ($p < 0.05$). However, the p-value was slightly higher in case of family history ($p > 0.05$) which depicts that it is not much significant in the current data being a non modifiable risk factor.

Table 4: t-test.

Variables	T	df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
				Lower	Upper
Age	53.887	97	.000	55.69	59.95
Gender	32.166	97	.000	1.07	1.21
Family History	2.284	97	.025	.01	.10
Complaints	22.887	97	.000	1.17	1.40
CAD Presentation	25.694	97	.000	2.63	3.07
No of Diseased Vessel	25.563	97	.000	1.81	2.11
Management	17.338	97	.000	7.35	9.25

DISCUSSION

CAD is referred to as a multifactorial disease and an essential part of it is the response to different environmental and genetic impacts. Genetics, marital status, family history, age and gender are unchangeable factors in human life. In this study, we focused on some of these non-modifiable factors associated with CAD. The objective was to highlight the significance of non-modifiable risk factors in the development of CAD in local population as very limited information is available in this region. It is evident that appropriate knowledge and awareness about non modifiable risk factors for developing CAD is important for management of the disease and for decreasing its mortality rate.

In this study, the significance of non-modifiable risk factors i.e., age, gender and family history were assessed along with various dependant variables including complaints, CAD presentation, number of diseased vessels and disease management.

Age is a non-modifiable risk factor. Previous studies conducted among adults or older people suggested that chances of developing CAD increase with age due to the rise in serum cholesterol and high blood pressure.¹⁷ However, nowadays, all age groups including the adolescents are likely to develop the risk factors for CAD at early ages due to the modern family structures.¹⁸ The mean age of patients in this study turned out to be 58. t-test results showed significant results ($p < 0.05$) for age as a non-modifiable risk factor

thus, affirming the association of age as a non-modifiable risk factor with CAD.

The second non-modifiable risk factor is gender. Data from this study showed the number of male CAD patients was higher. This indicates that among people presented at PIC with symptoms of chest pain or shortness of breath and underwent angiography, the percentage of women with risk of CAD is fewer than men. Previous studies suggest that although men are more likely to develop or at greater risk of developing CAD than females, but the mortality rates are considerably higher in case of females.¹⁰¹⁹ The significance results from our study for gender as a non-modifiable risk factor correspond to the previous studies as ($p < 0.05$).

Another important non-modifiable CAD risk factor is family history of MI. Previous studies revealed that having one or more first-degree relatives with CAD can lead to three-to six-fold increase in the risk for developing CAD.²⁰ Family history is also directly associated with CAD development in especially in young ones or with non elevated initial high sensitive troponin (hs-cTnT) levels.²¹ The t-test results show no significance in this study for family history as a non-modifiable risk factor.

Area wise most of the patients presented at PIC were from Peshawar, Mardan and Charsadda. 99% of the patients in this data were married, thus making marital status a noteworthy factor associated with CAD as depicted in Graph 3.1.

Maximum patients (75.5%) presented at PIC had a chest pain complain making it a common symptom associated with CAD. The arterial access site used for most of the patients was radial with a percentage of about (86.7%), making it the most successful approach for PCI procedures. Most of the patients were suffering from double vessel disease (45.9%) followed by single (29.6%) and triple vessel (23.5%) disease in patients presented at PIC. 98% of the patients in our data went under PCI treatment as mentioned in the Table 2.

The most common CAD presentation among these patients was unstable angina (36.7%) followed by STEMI (27.6%); which indicates these two being the most common CAD presentations among KPK population as shown in Graph 3.2. For the disease management, maximum patients had PCI to LAD (41.8%) followed by PCI to RCA (17.3%); suggesting LAD and RCA being the most common diseased vessels among CAD patients as indicated in Graph 3.

Limitations

The major limitation of this study was the sample size as 93% of the patients in this data did not have any previous family history of CAD. Secondly, the study was single-centred as it involved only one institute from this region. The ethnicity was not included as a non-modifiable risk factor in this study as all the patients belonged to the province of Khyber Pakhtunkhwa

having similar ethnicity. For future prospective, the study can be conducted on larger populations and in other cities of Pakistan.

CONCLUSION

According to the results of our study, it is concluded that in patients with CAD, risk increases with ageing and the incidence of the disease in male patients is more frequent than in the females. The study also suggested that family history of CAD did not significantly act as a risk factor for CAD in patients. Following a healthy lifestyle from early age can help in the prevention of various cardiovascular diseases including CAD. According to the previous literature which shows that healthy lifestyles lowered the risk of CAD regardless of previous family history. Thus, adherence to a healthy lifestyle is substantially important in the prevention of CAD regardless of underlying risk factors.

Recommendations:

Our study highlighted the fact that CAD is becoming more prevalent among younger population and large-scale study is required to assess for unknown risks factors as well as its true pathobiology.

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Conflict of Interest

The authors hereby declare no conflict of interest.

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